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PALLID STURGEON RECOVERY UPDATE

- the latest research and management actions for recovery -

Pallid Sturgeon Recovery Is a Step Closer

The Pallid Sturgeon Recovery Program is a small, but significant, step closer to achieving recovery objectives after the crew at the Gavins Point National Fish Hatchery (NFH), Yankton, South Dakota, successfully spawned two females and three males on June 16-18, 1997. These five fish were captured from the Missouri and Yellowstone Rivers in North Dakota under direction and guidance of the Missouri River Fish and Wildlife Management Assistance Office, Bismarck, North Dakota. The successful event produced nearly 300,000 green eggs, with 75,000 of them being shipped to facilities throughout the country to accomplish research regarding genetics, taxonomy, environmental contaminants, habitat selection and behavior. Approximately 5,000 juveniles were retained for population augmentation, broodstock development, other research needs, and outreach.

The five sturgeons spawned this year have an interesting history. Two of the three males (41 and 37 lbs.) were captured in North Dakota in September 1993 by the Missouri River Fish and Wildlife Management Assistance Office. They were transported approximately 500 miles to the Gavins Point NFH to be held as broodstock. The other male (26 lbs.) and the two females (55 and 50 lbs.) were captured by biologists in the fall of 1996. These fish were temporarily held at the Garrison Dam NFH before being relocated to the Gavins Point NFH when netting operations ended for the year. While at Garrison Dam NFH, the 55-pound female contracted a fungal infection on her abdomen. She had to be treated and recover before being transported. She did not heal sufficiently to travel the long distance until January 6, 1997, when the Dakotas were in the heart of a record cold winter. Ice was forming on the large round tank where she was being held in at the Garrison Dam NFH in the unheated building. Despite her troublesome adventure, she was the best producing female.

The juvenile pallid sturgeons are being cultured as separate family lots to maximize genetic diversity. Recovery plans call for spawning and population augmentation in each of the next 6 years. Starting in 1998, approximately 1,500 juveniles will be released back to the wild in the upper basin. Even with this year's success, population augmentation is just one ingredient in the recipe of recovery. Species protection and habitat restoration will continue to achieve equal attention on other fronts. Contacts: Mark Dryer, Missouri River FAO, Bismarck, North Dakota (701-250-4419) or Herb Bollig, Gavins Point NFH, Yankton, SD (605-665-3352).

Pallid Sturgeon Recovery Team Members

Mark Dryer (Leader), US Fish and Wildlife Service, Bismarck, North Dakota.

Dr. Frank Chapman, University of Florida, Gainsville.

Kim Graham, Missouri Dept. of Conservation, Columbia.

Dr. Kent Keenlyne, US Fish and Wildlife Service, Pierre, South Dakota.

Doug Latka, US Army Corps of Engineers, Omaha, Nebraska.

Bobby Reed, Louisiana Department of Wildlife and Fisheries, St. Charles.

James Riis, South Dakota Game, Fish and Parks Department, Pierre.

Bill Gardner, Montana Department of Fish, Wildlife and Parks, Lewistown.

Fishermen at the Missouri and Platte River Confluence Keep Catching Pallid Sturgeon

Darrell Feit, Manager at Ak-Sar-Ben Aquarium in Plattsmouth, Nebraska, has experienced a larger number of pallid sturgeon captured and reported by anglers fishing the Missouri and Platte Rivers in Nebraska. In 1995 and 1996, four suspected pallid sturgeon were reported captured in each of those years. As of July 9, 1997, seven suspected pallid sturgeon have been reported. Not all the reported pallid sturgeon are confirmed as pallids, but their large reported size would make it likely they are pallids. Darrell thinks the higher number of reports can be attributed to greater awareness of anglers. Contact: Darrell Feit (402-332-3901).

US Bureau of Reclamation Decision Support System Model Development Underway

The Decision Support System (DSS) is a computer tool being developed to display the response of natural and commodity based resources linked to operation of Reclamation facilities on the Yellowstone River. The key to its success is to accurately reflect those linkages using the most recent and accurate data. The DSS software will simply integrate and display those responses to allow managers to run "what if" scenarios to aid in water management. Benthic fish distribution, abundance and habitats are being recorded by Montana State University and Montana Department of FWP through standard protocols developed for use throughout the basin. Two dimensional habitat mapping is being closely coordinated by USGS to describe the influence of microhabitat variables on site selection. Specialists throughout the basin are being consulted on flood control benefits, reservoir visitation, hydropower, tern and plover use, cottonwood recruitment, river recreation and tailwater fisheries as a function of river flow and reservoir elevation. Contact: Tom Parks, Bureau of Reclamation, Montana Projects Office, Billings, (406-247-7314).

US Bureau of Reclamation Investigates Yellowstone River Barriers

The second year of a 3-year study to evaluate fish passage on the Yellowstone River is complete. Electrofish sampling, marking, and recapture runs have been conducted above and below Huntley and Intake Diversion Dams. Subsampling of flows serving the main canal at Intake by deployment of nets indicates a wide spectrum of resident Yellowstone River fish in the catch.

Completed tasks are: a GPS referenced database of withdrawal facilities on the Yellowstone and tributaries, including hydraulic characteristics. A literature survey of Yellowstone fish work was done in 1996.

A prototype DSS and reports on survey work above and below Cartersville and Huntley Dams as well as entrainment at Intake will be developed and distributed in FY 1998. Cooperators on these projects include MTDFWP, USGS, FWS, WAPA, Corps of Engineers and Reclamation's Technical Service Center. Contact: Tom Parks, Montana Projects Office, Billings, (406-247-7314).

Assessment of Endocrine-Disrupting Contaminants in Reference to the Federally Endangered Pallid Sturgeon in the Middle Mississippi River.

Many organochlorine insecticides and some metals are recognized endocrine-disrupting chemicals and as such have a variety of biological effects, but principally adversely affect the role of hormones in controlling organism development and reproduction. Chlordane has been reported as having endocrine-disrupting effects and the Missouri Department of Conservation has identified problems with chlordane contamination in fish of the Middle Mississippi River for several years. This study will investigate the potential cause of significantly diminished reproductive capacity and population declines in pallid sturgeon in the Middle Mississippi River by evaluating the effects of endocrine-

disrupting contaminants on pallid sturgeon, shovelnose sturgeon (*S. platorynchus)*, and channel catfish (*Ictalurus punctatus)*. Beginning in July 1997, blood will be collected from pallid sturgeon, and tissues and organs from a selected number of shovelnose sturgeon and channel catfish. No results are available to date. A final report will be prepared by June 30, 1998. Contact: Melanie Young, Ecological Services, Rock Island, Illinois (309-793-5800 x514).

Contaminant Evaluation of Shovelnose Sturgeon From the Atchafalaya River, Louisiana

ABSTRACT

Baseline contaminant levels in shovelnose sturgeon (*Scaphirhynchus platorynchus*) collected from the outfall channel of the Old River Control Structure (ORCS), Concordia Parish, Louisiana, are discussed. Our investigation also complemented previous Missouri River and upper Mississippi River studies on the suitability of the shovelnose sturgeon as a surrogate species for assessing contaminants in the endangered pallid sturgeon (*Scaphirhynchus albus*). Shovelnose sturgeon were analyzed as individual whole-body specimens for organochlorine pesticides, total polychlorinated biphenyls, polycyclic aromatic hydrocarbons, aliphatic hydrocarbons, and trace elements. Results are compared to data from other fish species that were previously collected downstream of the ORCS in the Atchafalaya Basin, to data from the National Contaminants Biomonitoring Program (NCBP), and to shovelnose and pallid sturgeon data from other areas (i.e., ORCS and the northern United States).

Shovelnose sturgeon collected from the ORCS contained higher organochlorine pesticide levels than were previously found in fishes collected from downstream sites. Those levels were comparable to the levels observed in NCBP fishes and in samples of shovelnose from the northern United States; however, toxaphene and total organochlorines were elevated in all circumstances, except when compared to ORCS pallid sturgeon. Few polycyclic aromatic hydrocarbons were detected in the ORCS shovelnose sturgeon and all were at low levels. Our data also indicate that about half of the ORCS shovelnose sturgeon sampled were exposed to petrongenic aliphatic hydrocarbons. ORCS shovelnose trace element concentrations were lower than those documented in other fishes from the same general area, but were elevated in comparison to NCBP levels and, for the most part, to shovelnose sturgeon collected in the northern United States. The results of this study also corroborate previous investigations, i.e., that it may be the best available surrogate for contaminant studies on the pallid sturgeon. Authors: Paul Conzelmann and Terry Rabot (Fish and Wildlife Service, Lafayette, 318-262-6630) and Bobby Reed (LA Dept. Of Wildlife and Fisheries, Lake Charles, 318-491-2577).

Ultrasound Tested as Method to Determine Gender and Stage of Maturity on Pallid and Shovelnose Sturgeon.

In May 1997, personnel from the Missouri River Fish and Wildlife Management Assistance Office and Garrison Dam National Fish Hatchery worked with the owner of a mobile ultrasound unit to test the theory that gender and maybe even stage of maturity could be ascertained without performing surgical procedures. Five pallid sturgeon of unknown gender were scanned with a medical ultrasound unit. No differentiating features were observed in the scan. The fish were later surgically biopsied. Four were males and one was a female.

In addition, four shovelnose sturgeon were scanned. All four fish (two males and two females) were sexed correctly with the ultrasound scan, although stage of maturity could not be ascertained. In the shovelnose sturgeon, egg masses on the ovaries were clearly evident.

The one female pallid sturgeon that could not be differentiated from the males with ultrasound died a few weeks later after attempting to spawn her. An autopsy revealed larger amounts of fatty tissue on the ovaries than had been previously observed on other females with mature eggs,

which could have explained our inability to differentiate her from the males when gender was evident on shovelnose sturgeon. Although the procedure was only partially successful, ultrasound could prove to be a useful tool as the technology improves. Contact: Wade King, Missouri River FAO, Bismarck, North Dakota (701-250-4419).

Population Structure and Habitat Use of Benthic Fishes in the Missouri River

The "Benthic Fishes Study" is in its 3rd of a 5-year study describing recruitment, growth, size structure, body condition, and relative abundance of selected fishes collected from nine river sections between Montana and Missouri. Physical and water quality features are also measured where fishes are collected. The goal of the study is to provide resource managers information to help evaluate how potential changes in Missouri River system operating procedures may affect benthic fishes.

In 1996, a total of 25,692 fishes representing at least 78 taxa and two hybrids were collected. The most species (40) were collected in the segment downstream of Gavins Point Dam, and the least (16) in segments downstream of Fort Peck Dam. In the upper river segments, dominant taxa included flathead chub and *Hybognathus* species. In downstream sections, flathead chub were replaced by gizzard shad and channel and flathead catfish. Relative abundance tables and habitat use, size structure, and relative abundance figures for all taxa collected in 1996 are presented in the annual report. The report is available from Dave Galat, Coordinator, Cooperative Fish and Wildlife Research Unit, Columbia, Missouri (573-882-9426).

Louisiana Department of Wildlife Studies Pallid Sturgeon Populations

The Louisiana Department of Wildlife and Fisheries (LDWF) continues to assess pallid sturgeon populations in Louisiana's big rivers. The Department is currently cooperating with the State of Arkansas to sample the middle Red River from the Arkansas/Oklahoma state line to Shreveport, Louisiana. While a number of shovelnose sturgeon have been seen and captured, no pallid sturgeon have been confirmed in this reach of the Red River to date. This study will continue into 1998.

Since the discovery of pallid sturgeon in the hydroplant outfall channel in the summer of 1991, the Inland Fish Division of the Louisiana Department of Wildlife and Fisheries (LDWF) has been conducting status and distribution surveys for pallid sturgeon in the vicinity of the Old River Control Complex on the Mississippi and Atchafalaya Rivers. The Complex consists of two Corps of Engineers (COE) water diversion structures and a privately owned and operated hydropower plant. The functions of the COE structures is to pass sediment laden water into the Atchafalaya Basin for channel maintenance and flood control. The power plant produces electricity for surrounding communities by passing Mississippi River water across turbines and into the Atchafalaya River Basin.

Specifically, the Inland Fish Division of LDWF is collecting data on sturgeon abundance, distribution, population size, gear selectivity, and habitat preference. Primary gear types being used to sample juvenile and adult sturgeon include 2, 3, and 4-inch bar mesh gill nets and 3-foot diameter by 1½-inch mesh hoopnets. Additionally, fisheries crews accompany commercial fishermen while they were lifting their nets. Any sturgeon captured are immediately removed from fishermen's nets and placed in LDWF live tanks for examination and data recording. Any pallid sturgeon encountered are being handled according to protocol developed by the Pallid Recovery Team. Section 6 funds from the USFWS are being employed to conduct these surveys. Contact: Bobby Reed, LDWF, Lake Charles (318-491-2577).

Systematic Sampling for Sturgeon and Other Fishes

The Montana Department of Fish and Parks (MTDFWP), through funding provided by the Western Area Power Administration, are in their 4th year of a study to systematically

sample stations in Montana and North Dakota on the Missouri River between Lake Sakakawea and Ft. Peck Dam, and on the lower Yellowstone River. The study objectives are: 1) to investigate relationships between shovelnose sturgeon, pallid sturgeon, and other aquatic organisms in relation to river reach, discharge, habitat type, season, and physical habitat characteristics, 2) monitor larval drift of sturgeon and other fish, 3) identify pallid sturgeon spawning locations on the Missouri River above the Yellowstone River confluence, and 4) assess the population status of adult pallid sturgeon on the Missouri River above the Yellowstone River confluence. Contact: Jim Liebelt, (MTDFWP), Fort Peck, (406-526-3471).

Pallid Sturgeon Recovery Team Meeting and Change in Membership

The Pallid Sturgeon Recovery Team met October 1-3 in North Dakota to hear presentations on recovery activities and discuss future recovery direction. Over the next few years, the Recovery Team will be amending the 1993 Recovery Plan to reflect new information and to be more specific in identification of recovery objectives and tasks.

Dr. Phil Stewart, Recovery Team Member from Montana Department of Fish, Wildlife and Parks (MTDFWP) in Miles City, Montana, will retire from the Department next year. He is being replaced on the Recovery Team by Bill Gardner, MTDFWP in Lewistown. Phil's research and management experience on the Yellowstone River was an asset to the Team that will be missed. Bill has extensive research and management experience on the Missouri River.

Mike LeValley, Region 3 Fish and Wildlife Service liaison to the Recovery Team, has taken on new job responsibilities as Missouri River Natural Resource Committee Coordinator for the Service and member states. Mike has been replaced by Jim Milligan as Region 3 liaison to the Team. Jim is Project Leader for the Fishery Assistance Office in Columbia, Missouri. Fish and Wildlife Service liaisons from other Service Regions serve an important function in communicating Recovery Team activities to Service offices outside Region 6. Contact: Mark Dryer, Missouri River FAO, Bismarck, North Dakota (701-250-4419).

Missouri Department of Conservation Successfully Spawns Pallid Sturgeon

On May 1, 1997, Jerry Hamiton, Hatchery Manager at Blind Pony State Fish Hatchery, Missouri Department of Conservation (MDC), successfully spawned pallid sturgeon captured from the Middle Mississippi River in Missouri. Thirty to forty thousand eggs were hand-stripped from two females and fertilized by sperm of three males. Family lots were kept separate. In September, 3,400 will be tagged and stocked to the Missouri and Mississippi Rivers in Missouri, and in the Missouri River near the mouth of the Platte River in Nebraska. Surplus eggs and fry were provided to universities and Federal facilities for recovery related studies on environmental contaminants, temperature tolerance, and other needs.

The Hatchery continues to experience problems with crayfish/turbidity problems in holding ponds. Crayfish remain a preferred food item, but they cause the pond bottom to become soft and the layer of resultant fluff appears to inhibit feeding. Additionally, the hatchery continues to have problems with river otters. In 1995, personnel at Blind Pony Hatchery observed a river otter leaving a pond with a sturgeon in its mouth. During December 1996, river otters were observed in the sturgeon ponds, as well as most other ponds containing fish, and within about a week, ten otters were live-trapped and moved into another stream drainage.

Because of the increasing presence of river otters at Blind Pony Hatchery, MDC believes that facilities must be improved if they are to hold broodstock for future reference. To successfully hold broodstock sturgeon, they should be held in circular tanks and protected inside a building. MDC still has the capability to spawn and rear young pallid sturgeon intensively, however,

broodstock must be collected from the wild each year.

During March 1994, approximately 7,200 pallid sturgeon fingerlings (spawned and held at Blind Pony Hatchery since 1992) were stocked into eight sites along the lower Missouri River and middle Mississippi River below St. Louis. Since stocking, 45 recaptures have been reported. All but eight were reported from the Mississippi River and twelve were captured by sport anglers fishing over sandbars and using worms as bait. Most of the reported sturgeon are 20-22 inches total length and in excellent condition. Propagation and stocking has been conducted in accordance with the MDC Action Plan For Pallid Sturgeon In Missouri dated 1995, as modified. Contact: Kim Graham, MDC, Columbia, Missouri (573-882-9880 x3227).

Pallid Sturgeon Population Augmentation Planned for North Dakota and Montana

A draft 6-year plan for augmenting pallid sturgeon populations in Recovery Priority Areas 1 and 2 in North Dakota and Montana was completed in June 1997. The plan's goal is to reconstruct an optimal population size within the habitat's carrying capacity, while preserving and maintaining the gene pool to the greatest extent possible. This will be accomplished by stocking a maximum of 500-750 juvenile pallid sturgeon in the Missouri River above Fort Peck Reservoir, and 500-750 juveniles in the Missouri and Yellowstone Rivers confluence area above Lake Sakakawea. Successful propagation of pallid sturgeon from North Dakota last spring will initiate action under the plan. A monitoring program will be an important part of the program; see report on systematic sampling in Montana and North Dakota, page 4. Contact: Steve Krentz or Mark Dryer, Missouri River FAO, Bismarck, North Dakota (701-250-4419).

Kent Keenlyne Retires From the Fish and Wildlife Service

Kent Keenlyne, Missouri River Coordinator for the Service, and Pallid Sturgeon Recovery Team member, retired in January 1997. Kent wishes to stay active in pallid sturgeon recovery activities and we welcome his continued involvement on the recovery team. His previous position with the Service in Pierre, South Dakota, was filled by Mark Albers, a previous employee of the Bureau of Reclamation in Billings, Montana. Mark was actively involved in aquatic resource studies on the Yellowstone River.

Pallid Sturgeon and Candidate Fishes Mitigation Agreement Reached

The Fish and Wildlife Service, in close coordination with the Nebraska Game and Parks Commission (Commission), is negotiating an agreement with the Metropolitan Utilities District on mitigation to offset potential adverse impacts to pallid sturgeons and candidate fish species resulting from the Metropolitan District's proposed water withdrawals from well fields along the Lower Platte River. Under the proposed agreement, the Metropolitan Utilities District will deposit slightly more than $1 million into a non-government organization's trust account for land acquisition and other projects that benefit the recovery of the affected fish species. First priority is to purchase land to expand public ownership at the Schilling Wildlife Management Area in order to successfully accomplish an on-site riverine habitat restoration project currently being contemplated by the Commission, Service, and Army Corps of Engineers. Contact: Steve Anschutz, ES, Grand Island, Nebraska (308-382-6468).

Oil Spill Response Plan and Resource Mapping Completed at Missouri and Yellowstone Rivers Confluence Area

The Missouri River Fishery Assistance (MRFAO) and the Habitat and Population Evaluation Team (HAPET) of the Service in Bismarck, partnered with the North Dakota Game and Fish Department to prepare an oil spill response plan for the Missouri and Yellowstone Rivers confluence area. The project was initiated to minimize the environmental impacts of an oil spill on

important fish, wildlife, recreational, and cultural resources in the project area, which provides important habitat for the federally listed pallid sturgeon, least tern, bald eagle, and other species of management concern. To accomplish this objective, the report provides information and guidance to facilitate timely and effective coordination and cooperation among oil companies, Federal and State agencies, irrigation districts, and other parties involved in spill detection, prevention, and cleanup. The project area has seen heavy oil development in the floodplain and adjacent uplands. Since 1994, there have been one minor and two major spills in the project area. Contact: Mark Dryer, Missouri River FAO, Bismarck, North Dakota (701-250-4419).

Pallid Sturgeon Catch Record Database Updated

The Missouri River Fishery Assistance Office in Bismarck maintains a range-wide database on pallid sturgeon catch records. The database information is current through 1996. The records include information on catch date and location; fish length, weight, morphologic and meristic characters; gear type; tag number; and other information, when available. Contact: Steve Krentz, Missouri River Fishery Assistance Office (701-250-4419).

Missouri River Master Manual Review Recommendations Still Being Developed

The Army Corps of Engineers has again extended the Master Manual Study report and Environmental Impact Statement. Tentative date for completion of the draft report is May 1998. The Master Manual is the umbrella document that provides the guidance and criteria for reservoir storage and dam releases, and establishes priorities for project purposes. The Fish and Wildlife Service has promoted an ecosystem approach to the development of environmental operations alternatives that mimic a natural hydrograph and improve the environmental health of the system. Contact: Roger Collins, ES, Bismarck (701-250-4492).

Pallid Sturgeon Mounts Available

The Fish and Wildlife Service has contracted with a taxidermist in Minnesota to mount a 40-pound pallid sturgeon that died in the hatchery. Fiberglass reproductions of the mount are available from the taxidermist for $450. They look pretty good. Contact: Matt Yernatich, Artistic Anglers (800-544-7466), or Steve Krentz, Missouri River FAO (701-250-4419).

Fish and Wildlife Service Proposes to Expand Boyer Chute NWR

As part of the Back to the River Project, the Service is proposing to add approximately 7,900 acres to the Boyer Chute National Wildlife Refuge, resulting in a total refuge area of 9,912 acres. The Back to the River project is intended to restore fish and wildlife habitat in the Missouri River floodplain and increase public recreation opportunities along the river corridor. The refuge, which is currently 2,000 acres, is located approximately 6 miles north of Omaha and one-half mile east of Fort Calhoun, Nebraska. Contact: Jon Kauffeld, Fish and Wildlife Service, Grand Island, Nebraska (308-382-6468).

Paddlefish Exhibit Low Physiological Responses to Various Handling Stressors

The objectives of this study were to determine: 1) the magnitude and time course of physiological responses to a 30-second aerial-emersion handling stressor; 2) the effect of adding salt to the recovery medium on these stress-induced changes; and 3) the magnitude and time course of physiological responses resulting from 1 hour of continuous chasing. To assess the extent of physiological disturbance, researchers measured changes in plasma cortisol, glucose, chloride and lactate, and hematocrit before and after fish were stressed. Such tests are practical

because they relate to the fish's state of health under conditions of stress and this serves as a useful measure of potential survivorship. After 30 seconds of handling, plasma cortisal significantly increased. The response was similar in pattern to that in teleosts, but was much smaller in magnitude and was also lower than what has been previously documented in many teleost fishes from a variety of disturbances. Saline water as a recovery medium did not significantly alter any physiological constituent measured or alter recovery time of the stressed fish. The reasons for this difference are presently not known and investigations are currently in progress to assess differences in internal tissue structure between paddlefish and selected teleosts. Similar research is being conducted on surplus pallid sturgeon being reared at Gavins Point NFH. Contact: Bruce Barton, University of South Dakota, Vermillion (605-677-5211) or Herb Bollig, Gavins Point NFH, Yankton, South Dakota (605-665-3352).

Shovelnose Sturgeon Reintroduced to Bighorn River in Wyoming

In 1996 and 1997, shovelnose sturgeon were spawned at Miles City State Fish Hatchery and Garrison Dam NFH for reintroduction to the Bighorn River between Worland, Wyoming, and the Bighorn Reservoir. Progeny were reared at Gavins Point NFH. The objectives of the project are to: 1) re-establish shovelnose sturgeon in their historical native range of the Bighorn River basin; 2) provide an additional sport fishery for anglers in the Bighorn River basin; and 3) enhance biodiversity in the Bighorn River. The Department is re-establishing shovelnose sturgeon populations through a combination of stocking fry and juvenile sturgeon. Stocking occurred in 1996 and 1997. Contact: Tom Annear, Wyoming Game and Fish Department, Cheyenne (307-777-459).

Rearing Information on Pallid Sturgeon From 1992 Spawn at Blind Pony SFH

Pallid sturgeon received as fry from Blind Pony SFH continue to grow and do well at Gavins Point NFH. They range in size from 441-720mm (fork length). The fish are held in 12' and 20' diameter circular fiberglass tanks and continue to accept Silver Cup Salmon 5/32" fish food formulation with a conservation (to date) of 8.85. These fish are fed to satiation, which is nearly 0.5-1.0 percent during the winter and in the range of 1.0-2.0 percent in the summer. Reduced densities, well below those needed for trout and other species of fish, are more conducive to attain maximum growth. These fish were elastomere-tagged 3½ years ago. No tissue damage or tag loss has occurred. Water temperatures in the rearing tanks have ranged between 45-50 °F in the winter and 60-70 °F during the summer. Contact: Herb Bollig, Gavins Point NFH, Yankton, South Dakota (605-665-3352).

Surplus Pallid Sturgeon Available From 1992 Spawn at Blind Pony SFH

Surplus pallid sturgeon propagated from the 1992 spawn at Blind Pony SFH are growing and taking up too much room at the hatchery. Herb Bollig has about 100 more than he needs. If you are interested in receiving some of these fish for recovery related research or education, contact Mark Dryer, Missouri River FAO, Bismarck, North Dakota (701-250-4419).

American Rivers Names Missouri River Most Endangered

On April 16, American Rivers, the Nation's leading river conservation group, named the Missouri River as the most endangered and threatened river in North America. Each year, American Rivers names North America's ten most endangered rivers. The list includes rivers endangered by mines, dams, pollution, flood control projects, and other impacts. This national recognition of the Missouri River draws attention to the degradation of its fish and wildlife resources.

Missouri River Monitoring Plan Being Developed

In 1994, the operational changes proposed by the Corps of Engineers (COE) under the

Master Manual Review study demonstrated the need for a scientific understanding of how such changes might affect the river's ecosystem. The need to collect long-term natural resource data was widely recommended and supported by individuals and agencies attending public meetings on proposed changes. In response to this identified need, the Missouri River Basin Association (MRBA) requested that the Missouri River Natural Resource Committee (MRNRC) develop a Missouri River Monitoring Plan. For the past year, 75 individuals representing 12 state and 7 Federal agencies working more than 400 days, attended a series of working meetings, facilitated through COE support, to design the *Missouri River Environmental Assessment Program*. The goal of the Environmental Assessment Program is to provide the scientific basis for optimum management of the Missouri River's main stem and floodplain fish and wildlife resources, while avoiding or minimizing conflicts with other river uses. The program objectives are to understand and predict: 1) species, community, habitat and water quality responses to different flow regimes, including intra-system regulation; 2) biological response to structure addition, modification or removal; and to understand and predict; and, 3) the impact of physical changes due to aggradation (sedimentation) in the upper reaches of reservoirs and degradation (incision) below the dams on biota and habitat. The biological components to be sampled at selected reaches over time in relation to system operation are fish, benthic invertebrates, birds, herpetofauna, habitat and water quality. Contact: Gordon Farabee, Missouri River Natural Resource Committee, Jefferson City, Missouri (573-751-4115) or Mark Laustrup, Mid-Continent Ecological Science Center, Columbia, Missouri (573-875-5399).

Pallid Sturgeon Found In Fish Market

In early spring 1997, at least one and maybe four pallid sturgeon and six hybrids were found in a group of 79 sturgeon in an Illinois fish market. Fish and Wildlife Service law enforcement officers followed up on the report, but no arrests were made. The MICRA Paddlefish/Sturgeon Subcommittee is concerned about what impact the shovelnose sturgeon commercial fishery might be having on pallid sturgeon, and discussed several alternative solutions to the problem at their spring meeting in Hot Springs, Arkansas, on May 4-5, 1997. The subcommittee recommended that the parent committee of MICRA send a letter to the Service asking for: 1) definitive tests to determine in the field differences between sturgeon and paddlefish eggs, 2) Service law enforcement agents to become more involved in the issue and to cooperate with State agents, 3) biologists to begin checking fish markets to determine if pallid sturgeon are being taken illegally, and 4) funding to begin additional research studies on sturgeon. Contact: Kim Graham, MDC, Columbia, Missouri (573-882-9880 x3227).

Upper Basin Pallid Sturgeon Workgroup and MRNRC Recommend Experimental Release From Fort Peck Dam

The Upper Basin Pallid Sturgeon Workgroup held its fourth annual meeting in December 1996 in Miles City, Montana. It was suggested at the meeting that a letter be sent to the Army Corps of Engineers (COE) requesting Fort Peck Dam be operated in 1997 and 1998 more similar to the natural hydrograph to benefit native fishes. Specifically, the request was made of the COE to provide a flow in the Missouri River of 20,000-30,000 cfs in the May-June time frame. The COE responded noting the inability to meet the request in 1997 due to the near record snowpack in the upper basin, but left open options for the release in 1998. The Missouri River Natural Resource Committee (MRNRC) endorsed the experimental release and specifically recommended 25,000 cfs be released during the period of May 15 to June 15, 1998 in a letter to the COE dated September 5, 1997. Contact: Chris Hunter, Montana Department of Fish, Wildlife and Parks, Helena (406-444-3183).

Two Sturgeon-related Workshops Held Since Last *Update*

On September 27-28, 1996, the College of Southern Idaho, Twin Falls, Idaho, hosted a sturgeon broodstock management workshop. Papers focused primarily on sturgeon of the northwest and were presented orally and in hard copy for a printed workshop proceedings. Papers printed in the proceedings are: Epidemiology of Viruses In White Sturgeon From The Pacific Northwest by S.E. LaPatra, B.L. Parker and J.M. Groff; Development Of White Sturgeon Broodstock by Serge Doroshov; Broodstock Management Techniques And Spawning Induction Results by Joel Van Eenennaam; Studies Investigating The Propagation And Culture Of Shovelnose Sturgeon by Dave Erdahl; Cryopreservation of Sturgeon Milt by J.G. Cloud; California Sturgeon Culture by Ken Beer; Snake River Sturgeon Culture by Terry Patterson; and Sturgeon Culture At Clear Springs Foods, Inc by Rich Schneider.

On March 25-27, 1997, the US Fish and Wildlife Service's Southeast Region--Fisheries hosted a sturgeon workshop in Charleston, South Carolina. Papers focused primarily on sturgeon of the southeast and were presented on a wide range of topics, including overviews of sturgeon management plans, genetics, population dynamics, habitat and field assessment techniques, and culture.

Conferences on Natural Resources of the Missouri River

On January 14-16, 1997, a multi-disciplinary conference was held to provide a forum for information exchange between researchers and resource managers on issues related to the stewardship, ecology, and management of the Missouri River main stem, floodplain, and tributaries. The conference was jointly hosted by the Missouri River Natural Resources Committee and the Midwest Science Center, National Biological Service. Future conferences will be held at sites throughout the Missouri River Basin. Organization of the 1998 conference in Nebraska is currently underway. Contact: Gene Zuerlein, Nebraska Game and Parks Commission, Lincoln (402-471-5555).

Thesis Completed on "Quantification of Plasma Vitellogenin by an Enzyme-Linked Immunosorbent Assay and its Correlation to Plasma Calcium and Ovogenesis in the Shovelnose Sturgeon, *Scaphirhynchus platorynchus.*"

Masters Candidate, Lynn Hanson, completed his research on development of a non-invasive technique to identify the reproductive status of female shovelnose sturgeon with potential application to pallid sturgeon. He found that over the entire population, vitellogenin levels increased as ovogenesis advanced; however, differentiating individual scores within the vitellogentic stages were not possible. His thesis is undergoing final stages of review. The abstract follows.

The pallid sturgeon is one of the rarest fish indigenous to the Missouri and Mississippi Rivers Basin and exist precariously on the brink of extinction. The scarcity of the fish and its endangered species status has prevented sturgeon researchers from using this animal to obtain information on reproductive requirements. The shovelnose sturgeon is the closest relative of the pallid sturgeon and can provide a surrogate for obtaining information on reproductive development and processes. Sturgeon are long-lived chondrostei with late sexual maturity and asynchronous reproductive cycles requiring 2 or more years between spawning. By employing a direct technique used to detect vitellogenin in the blood plasma or an indirect method to detect calcium in the plasma, sturgeon researchers can identify those fish expected to spawn. This will eliminate previous invasive techniques used to assess the reproductive status of the female fish. When an endangered pallid sturgeon is captured and determined to be in vitellogenesis, the fish can be held in captivity, spawned, and later released. Progeny can be raised and released augmenting existing populations and restocking where suitable habitat has been made available. By employing a direct sandwich ELISA to

quantify vitellogenin in the blood plasma, this study determined that over the entire population, vitellogenin levels increased as ovogenesis advanced. Atomic absorption spectophotometry showed that calcium levels were correlated. However, differentiating individual scores within the vitellogenic stages were not possible. Only, non-vitellogenic and vitellogenic conditions could be identified. Calcium levels greater than 94 ug/ml indicated vitellogenic fish; however, some vitellogenic fish had calcium levels lower than 94 ug/ml. Furthermore, the youngest shovelnose sturgeon in vitellogenesis was 9 years of age and the oldest was 42 years of age. All stages of ovogenesis were found within each month (April-November) and 50% of the female population was found to be in vitellogenesis (score 5-8) throughout the year, implying a very long reproductive/ vitellogenic cycle. Female sturgeon in vitellogenesis 20 years and older consisted of 77% of the female population. Growth rates for shovelnose sturgeon declined significantly for both males and females at approximately 10 years of age. For rapid detection of vitellogenin in pallid sturgeon, the method of choice in the field may be simple immunodiffusion in fluids or double immunodiffusion with counter-current electrophoresis.
Contact: Lynn Hanson, Fishery Biologist/Animal Sciences; Bozeman, Montana, (406-582-0051).

MICRA Pallid Sturgeon Project Update

The Pallid Sturgeon Habitat Association and Characterization in the Lower Missouri and Middle Mississippi Rivers project was initiated in 1995 following the organizational meeting of the Central States Pallid Sturgeon Work Group (CSPSWG). One outcome of that meeting was the observation that there were several ongoing efforts to gather new information on pallid sturgeon in the upper Missouri and lower Mississippi Rivers basins, but very little in the central portions of the species' range. Columbia Fishery Resources Office (FRO) prepared a multi-State project proposal and received a $40,000 grant from FWS Region 6 in August 1995. This was converted into a MICRA project in order to preserve out year funding and the CSPSWG has since merged with the MICRA Paddlefish/Sturgeon Subcommittee by general agreement of the members.

The primary objective of this project is to document relative abundance, distribution, and habitat characteristics of pallid sturgeon and associated fish species in the lower Missouri and middle Mississippi Rivers. It is a cooperative venture between MICRA, the US Fish and Wildlife Service, National Biological Service-ECRC (NBS), and five state agencies. Participating State entities are: Southern Illinois University for Illinois Department of Natural Resources, Iowa Department of Natural Resources, Kansas Department of Wildlife and Parks, Nebraska Game and Parks Commission, and LTRM Open River Field Station at Cape Girardeau for Missouri Department of Conservation.

Columbia FRO completed a project protocol by August 1996 and participants were enlisted for field work. Sampling stations were selected from the database of locations where pallid sturgeon have been historically captured within the study reach. Each entity will sample five stations with multiple gears for at least one Fall (October-December) and one Spring (February-April) sampling period. Physical habitat measurements, as well as fishery data, will be collected. NBS will conduct bathymetric surveys of selected sites to evaluate habitat characteristics and help prepare the GIS component of the study. Columbia FRO will compile and analyze the data and prepare a final project report. Copies of the protocol are available upon request.

Most project participants were geared up and ready to initiate field work by late Fall of 1996, but were blocked by sustained high flows on the lower Missouri and middle Mississippi Rivers. This same condition prevailed during the Spring 1997 sampling period. Missouri and Nebraska participants attempted to deploy the sampling gear, but were stymied by high flows. Plans are to try again this Fall. Flows on the middle Mississippi may be low enough to conduct some survey work, but the Missouri is expected to be running high until ice-up due to nearly twice

normal discharges from Gavins Point Dam. The project area has experienced very unusual precipitation and hydrology in 4 of the past 5 years. We desperately need a year of something more "normal" in order to complete this project. Contact: Jim Milligan, Columbia FRO, (573-876-1909 x 102).

Behavior of YOY Pallid Sturgeon Investigated.

Boyd Kynard of the Conte Anadromous Fishery Research Center (CAFRC), Fish Behavior Section, conducted behavioral studies on YOY pallid sturgeon obtained as eggs from the spawn at Gavins Point NFH. The objectives of the studies were to (1) investigate ontogenetic changes in migration and behavior, and (2) investigate seasonal habitat selection of YOY pallid.

Laboratory experiments were conducted to observe migratory behavior and behavior in relation to illumination intensity, substrate color, and vertical distribution of embryos-larvae- and early juveniles. The results clearly show major behavioral differences between *Scaphirhynchus* and *Acipenser*. The migratory period and behaviors were successfully identified and data are being processed. Unfortunately, all fish eventually ceased feeding and died soon after the migration ceased. The likely cause was inadequate conditions during the critical early rearing period. It is likely that a combination of cool water and crowding caused the mortality. A progress report will be submitted by January 31, 1998, to appropriate agencies.

Laboratory experiments will be conducted in a new substrate-water velocity choice arena for young sturgeons. Experiments will begin in fall 1997 (early October), continue during the winter and spring 1998. Tests will expose individual fish to a range of velocities (low - <2 cm/s to high- 40 cm/s) and substrates (sand, gravel, rubble) and identify the preference of YOY during fall, winter, and spring.

If lab space is available, he will also test yearling fish during spring-summer 1998 to determine if yearlings resume downstream migration (and, thus distribute themselves throughout the river as shortnose sturgeon do). Contact: Boyd Kynard, CAFRC, Turners Falls, MA (413-863-8993).

Middle Mississippi River Pallid Sturgeon Movements and Habitat Associations

This report/study is authored by K. L. Hurley, R. J. Sheehan, R. C. Heidinger, P. S. Wills, and M. Schmidt.

The Pallid Sturgeon Recovery Plan identified the need to gain better understanding of the basic biological characteristics of the species. The present study was principally designed to address the Recovery Plan's Primary Task 3.2.1, "Conduct field investigations to describe the micro- and macro-habitat components of spawning, feeding, staging, and rearing areas." The study was conceived to utilize sonic telemetry to determine the movements, locations, and habitat use of pallid sturgeon. The specific project objectives were to identify and obtain information of habitats used by wintering and spawning pallid sturgeon in the Middle Mississippi River; i.e., the Mississippi River between the mouths of the Missouri and Ohio Rivers.

Twelve pallid sturgeon were obtained from commercial fishermen, Missouri Department of Conservation, and sampling conducted by Southern Illinois University at Carbondale (SIUC) and surgically implanted with sonic transmitters. Minimum size of pallid sturgeon used for transmitter implantation was originally 610-mm fork length. This minimum size for implantation was later lengthened to 686 mm. The fish were released as close to their capture site as practical.

Transmitters used were high-powered, transmitted at 40 khz, and were individually pulse-coded. Estimated life of the transmitters was 13 months. Fish locations were taken with a Sonotronics USR-91 receiver with a dual hydrophone array. Initial fish locations were made while tracking downstream at boat velocities of 11 to 13 km/h. Macrohabitats the study fish were located in were classified into one of the following categories: main channel (MCL), main channel border (association with an shoreline lacking current-obstructing features)(MCB), immediately

upstream of a wing dam (WDU), immediately downstream of a wing dam (WDD), the upstream portion of a wing dam tip (WTU), the downstream portion of a wing dam tip (WTD), between two consecutive wing dams (WDB), and the downstream side of an island tip (ITD).

The study fish ranged in size from 614 to 837 mm (standard length) and from 950 to 3039 g. A total of 103 contacts were made with the study fish from November 1995 through May 1996.

Although the study fish were located in association with each of the macrohabitat classifications, they were found in the MCL 46% of the time. They were also found in the similar MCB 12% of the time. Additionally, the study fish seemed to utilize the between wing dam areas to a large extent (19%).

At winter surface water temperatures below 10° but at or above 4° C, the study fish were found in the MCL 67% of the time. In addition, implanted sturgeon were located in the WDB area 25% of the contacts. Even at surface water temperatures lower than 4°C, implanted sturgeon were still found in the MCL and WDB areas the most, at 48% and 17%, respectively.

Pallid sturgeon in this study have been located in maximum water depths of 1.8 to 19.2 m. During 88% of the locations, study fish were found in depths from 3 to 12 m.

The magnitude of movements for the implanted pallid sturgeon on the middle Mississippi River varied greatly. Individual home ranges of the study fish were from 2.0 to 60.5 miles. Contact: Keith Hurley, SIU, (618-536-7761).

Biotelemetry and Assessment of Habitat Use by Pallid Sturgeon in the Lower Missouri River

The Environmental and Contaminants Research Center is currently in the third year of an ongoing project developing biotelemetry methods and habitat assessment capabilities to document movement and habitat use of large river fishes in the lower Missouri River. Over the past three field seasons, 32 pallid sturgeon and 8 hybrid sturgeon have been surgically implanted with long-life ultrasonic transmitters. Sturgeon used in this study have included both translocated and native fish. An extensive network of automated receivers was used to segment the Missouri River into 25 mile stretches, to monitor fish passage at selected locations and to document rapid long-range movement by sturgeon. Precise locations of sturgeon within each river stretch was determined periodically by field crews in boats and documented using GPS. Physical habitat characteristics were recorded and selected sites frequented by sturgeon were mapped using acoustic bathymetric survey equipment.

Automated receivers were effective at increasing the search efficiency of field crews by reducing unproductive search time, and provided a measure of search efficiency. Automated receivers were able to document rapid long-range movements of sturgeon and continued to monitor fish passage during extended times when field crews were unable to gain river access.

Pallid sturgeon were able to travel long distances in relatively short periods of time. Distances greater than 25 miles/day downstream and greater than 15 miles/day upstream at flood stage were recorded. These rapid movements would have been difficult to document without the existence of automated monitoring sites. Evidence for the seasonal movement of sturgeon was indicated by a trend toward upstream movement in the spring, and downstream movement in the fall. Maximum seasonal movements greater than 75 river miles were observed. During all seasons, pallid sturgeon were found in locations of high current velocity (0.5-1.5 m/sec) at the channel margin, near sand islands, and off the ends of wing deflectors, usually over a sand substrate. Depth at location ranged from <1 meter to 9 meters. Sturgeon were not found in slack water behind wing deflectors and closing structures, or in deep holes and connected scours. Pallid sturgeon readily moved across and within the main channel area, but did not frequent the navigation channel. Contacts: Aaron DeLonay or

Dr. Edward Little, Environmental and Contaminants Research Center, U.S. Geological Survey, Biological Resources Division, 4200 New Haven Road, Columbia, Missouri 65201
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Habitat, Movement, and Reproductive Status of Pallid Sturgeon Studied in the Lower Mississippi and Atchafalaya Rivers

In a report prepared for the Army Corps of Engineers, New Orleans District, by Louisiana State University, results are presented on pallid sturgeon distribution, reproduction, movement, habitat selection and impacts associated with operation of the Old River Control Structure. Twenty-six pallid sturgeon were surgically implanted with ultrasonic transmitters to research movement and habitat selection. Reproduction was researched by conducting larval fish tows in the area of the ORCS. The only evidence of reproduction was the observation of three gravid females on October and November 1994. Contact: Glenn Constant, LSU, (504-388-4177).

Share what you are doing for conservation of pallids and/or other elements of its ecosystem. Articles and associated materials are welcome. Send hard copy, disc copy, or email to Mark Dryer, 1500 Capitol Ave., Bismarck, ND, 58501, R6FFA_MRAO@mail.fws.gov

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